Shell Scripting tutorial

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How to write shell script

(1) Use any editor like vi or mcedit to write shell script.

(2) After writing shell script set execute permission for your script as follows

syntax:

chmod permission your-script-name

Examples: ***$ chmod +x your-script-name***

$ chmod 755 your-script-name

Note: This will set read write execute(7) permission for owner, for group and other permission is read and execute only(5).

(3) Execute your script as

Syntax: $ bash your-script-name OR

$ ./your-script-name (if executing from your current directory.)

# = comments

On the shell prompt type the following:

```
$ vim ginfo.sh
#!/bin/bash
## Script to print user information who currently login , current date & time
clear
echo "Hello $USER"
echo "Today is \c ";date
echo "Number of user login : \c" ; who | wc  -l
echo "Calendar"
cal
exit 0
```

In Linux (Shell), there are two types of variable:

***System defined variables* (SDV)-**

Created and maintained by Linux itself. This type of variable defined in CAPITAL LETTERS.

***User defined variables* (UDV) -**

Created and maintained by user. This type of variable defined in lower letters.

How to define User defined variables (UDV)

To define UDV use following syntax

Syntax:

variable name=value

'value' is assigned to given 'variable name' and Value must be on right side = sign.

Example:

```
$ no=10          # this is ok
$ 10=no          # Error, NOT Ok, Value must be on right side of = sign.
```

To define variable called 'vech' having value Bus

```
$ vech=Bus
```

To define variable called n having value 10

```
$ n=10
```

Rules for Naming variable name (Both UDV and System Variable)

(1) Variable name must begin with Alphanumeric character or underscore character (_), followed by one or more Alphanumeric character. For e.g. Valid shell variable are as follows

HOME ,SYSTEM_VERSION

Vech , no

(2) Don't put spaces on either side of the equal sign when assigning value to variable. For e.g. In following variable declaration there will be no error

```
$ no=10
```

But there will be problem for any of the following variable declaration:

```
$ no =10

$ no= 10

$ no = 10
```

(3) Variables are case-sensitive, just like filename in Linux. For e.g.

```
$ no=10
$ No=11
$ NO=20
$ nO=2
```

Above all are different variable name, so to print value 20 we have to use $ echo $NO and not any of the following

```
$ echo $no              # will print 10 but not 20
$ echo $No              # will print 11 but not 20
$ echo $nO              # will print 2 but not 20
```

(4) You can define NULL variable as follows (NULL variable is variable which has no value at the time of definition) For e.g.

```
$ vech=
$ vech=""
```

Try to print it's value by issuing following command

```
$ echo $vech
```

Nothing will be shown because variable has no value i.e. NULL variable.

How to print or access value of UDV (User defined variables)

To print or access UDV use following syntax,prefix a $ sign before the variable name

Syntax:

```
$variablename
```

Define variable vech and n as follows:

```
$ vech=Bus
$ n=10
```

To print contains of variable 'vech' type

```
$ echo $vech
```

It will print 'Bus',To print contains of variable 'n' type command as follows

```
$ echo $n
```

Caution: Do not try $ echo vech, as it will print vech instead its value 'Bus' and $ echo n, as it will print n instead its value '10', You must use $ followed by variable name.

Exercise

Q.1.How to Define variable x with value 10 and print it on screen.

Q.2.How to Define variable xn with value ILG and print it on screen

Q.3.How to print sum of two numbers, let's say 6 and 3?

Q.4.How to define two variable x=20, y=5 and then to print division of x and y (i.e. x/y)

Q.5.Modify above and store division of x and y to variable called z

Q.6.Point out error if any in following script

```
$ vim variscript
## Script to test MY knowledge about variables!
myname=ilg
myos = TroubleOS
myno=5
echo "My name is $myname"
echo "My os is $myos"
echo "My number is myno, can you see this number"
```

echo Command

Use echo command to display text or value of variable.

echo [options] [string, variables...]

Displays text or variables value on screen.

Options

-n Do not output the trailing new line.

-e Enable interpretation of the following backslash escaped characters in the strings:

\a alert (bell)

\b backspace

\c suppress trailing new line

\n new line

................cont...

....cont

\r carriage return

\t horizontal tab

\\ backslash

For e.g. $ echo -e "An apple a day keeps away \a\t\tdoctor\n"

Shell Arithmetic

Use to perform arithmetic operations.

Syntax:

```
expr op1 math-operator op2
```

Examples:

```
$ expr 1 + 3
$ expr 2 - 1
$ expr 10 / 2
$ expr 20 % 3
$ expr 10 \* 3
$ echo `expr 6 + 3`
```

Note: expr 20 %3 - Remainder read as 20 mod 3 and remainder is 2.

expr 10 * 3 - Multiplication use * and not * since its wild card.

Cont.......

declare

```
$ n=6/3
$ echo $n
6/3

$ declare -i n
$ n=6/3
$ echo $n
2
```

expr

```
$ z=5
$ z=`expr $z+1`   ---- Need spaces around + sign.
$ echo $z
5+1
$ z=`expr $z + 1`
$ echo $z
6
```

```
$ let z=5
$ echo $z
5

$ let z=$z+1
$ echo $z
6

$ let z=$z + 1    # Spaces around + sign are bad with let
                 -bash: let: +: syntax error: operand
                  expected (error token is "+")


$let z=z+1            # --- look Mom, no $ to read a
                     variable.
$echo $z
7
```

For the last statement note the following points

(1) First, before expr keyword we used ` (back quote) sign not the (single quote i.e. ') sign. Back quote is generally found on the key under tilde (~) on PC keyboard OR to the above of TAB key.

(2) Second, expr is also end with ` i.e. back quote.

(3) Here expr 6 + 3 is evaluated to 9, then echo command prints 9 as sum

(4) Here if you use double quote or single quote, it will NOT work

For e.g.

```
$ echo "expr 6 + 3"        # It will print expr 6 + 3
$ echo 'expr 6 + 3'        # It will print expr 6 + 3
```

More about Quotes

There are three types of quotes

"Double Quotes" - Anything enclose in double quotes removed meaning of that characters (except \ and $).

'Single quotes' - Enclosed in single quotes remains unchanged.

`Back quote` - To execute command

Example:

```
$ echo "Today is date"
```

Can't print message with today's date.

```
$ echo "Today is `date`".
```

It will print today's date as, Today is Tue Jan ....,Can you see that the `date` statement uses back quote?

Exit Status

By default in Linux if particular command/shell script is executed, it return two type of values which is used to see whether command or shell script executed is successful or not.

(1) If return value is zero (0), command is successful.

(2) If return value is nonzero, command is not successful or some sort of error executing command/shell script.

This value is know as Exit Status.

But how to find out exit status of command or shell script?

To determine this exit Status you can use $? special variable of shell.

e.g

```
$ ls

$ echo $?
```

It will print 0 to indicate command is successful.

The read Statement

Use to get input (data from user) from keyboard and store (data) to variable.

Syntax:

read variable1 variable2 ...variableN

$ vim sayH.sh

```
#!/bin/bash
#Script to read your name from key-board
echo "Your first name please:"
read fname
echo "Hello $fname, Lets be friend!"
```

Run it as follows:

```
$ chmod 755 sayH
$ ./sayH.sh
Your first name please: Jagjit
Hello Jagjit, Lets be friend!
```

Wild card Shorthand	Meaning	Examples	
*	Matches any string or group of characters.	$ ls *	will show all files
?	Matches any single character.	$ ls ?	will show all files whose names are 1 character long
[...]	Matches any one of the enclosed characters	$ ls [abc]*	will show all files beginning with letters a,b,c

More command on one command line

Syntax:

```
command1;command2
```

To run two command with one command line.

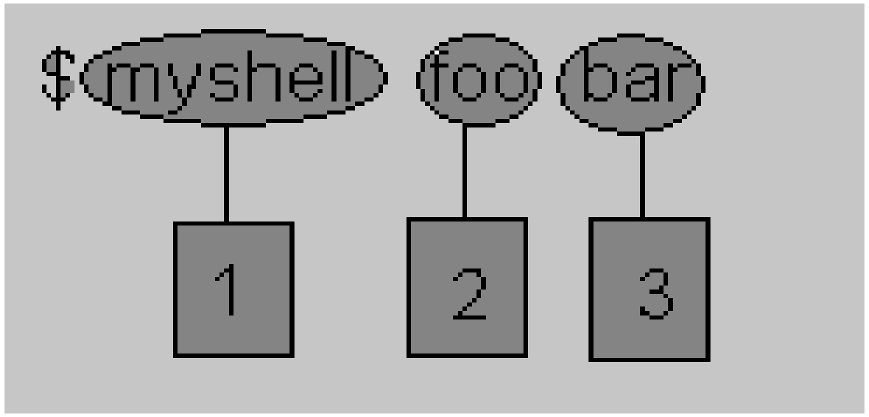
Examples:

```
$ date;who
```

Will print today's date followed by users who are currently login.

Command Line arguments

$ myshell foo bar



1) Shell Script name i.e. Myshell

2) First command line argument passed to myshell i.e. foo

3) Second command line argument passed to myshell i.e. Bar

$# holds number of arguments specified on command line.

$* or $@ refer to all arguments passed to script.

$1, $2, $3....actual arguments, and $0 represents scriptname

```
$ vim demo.sh
```

```
#!/bin/bash
## Script that demos, command line args
echo "Total number of command line argument are $#"
echo "$0 is script name"
echo "$1 is first argument"
echo "$2 is second argument"
echo "All of them are :- $* or $@"
```

Shift

The shift command reassigns the positional parameters, in effect shifting them to the left one notch.

$1 <--- $2, $2 <--- $3, $3 <--- $4, etc.

The old $1 disappears, but $0 (the script name) does not change.

If you use a large number of positional parameters to a script, shift lets you access those past 10, although {bracket} notation also permits this.

Using shift

```
#!/bin/bash
# shft.sh: Using 'shift' to step through all the positional parameters.
#  Name this script something like shft.sh,
#+ and invoke it with some parameters.
#+ For example:

# sh shft.sh a b c def 83 barndoor
until [ -z "$1" ]  # Until all parameters used up . . .
do
  echo -n "$1 "
  shift
done
echo              # Extra linefeed.

# But, what happens to the "used-up" parameters?
echo "$2"
#  Nothing echoes!
#  When $2 shifts into $1 (and there is no $3 to shift into $2)
#+ then $2 remains empty.
#  So, it is not a parameter *copy*, but a *move*.
exit
```

The shift command can take a numerical parameter indicating how many positions to shift.

```
#!/bin/bash
# shift-past.sh
shift 3    # Shift 3 positions.
#  n=3; shift $n
#  Has the same effect.
echo "$1"
exit 0
# ======================== #

$ ./shift-past.sh 1 2 3 4 5
4
```

if condition

if condition which is used for decision making in shell script, If given condition is true then command1 is executed.

Syntax:

```
if condition
 then
         command1 if condition is true or if exit status
         of condition is 0 (zero)
         ...
 fi
```

Condition is defined as:
"Condition is nothing but comparison between two values."
E.g

```
cat > trmif
#
# Script to test rm command and exist status
#
if rm $1
then
echo "$1 file deleted"
fi
```

test command or [expr]

test command or [expr] is used to see if an expression is true, and if it is true it return zero(0), otherwise returns nonzero for false.

Syntax:

    test expression OR [expression]

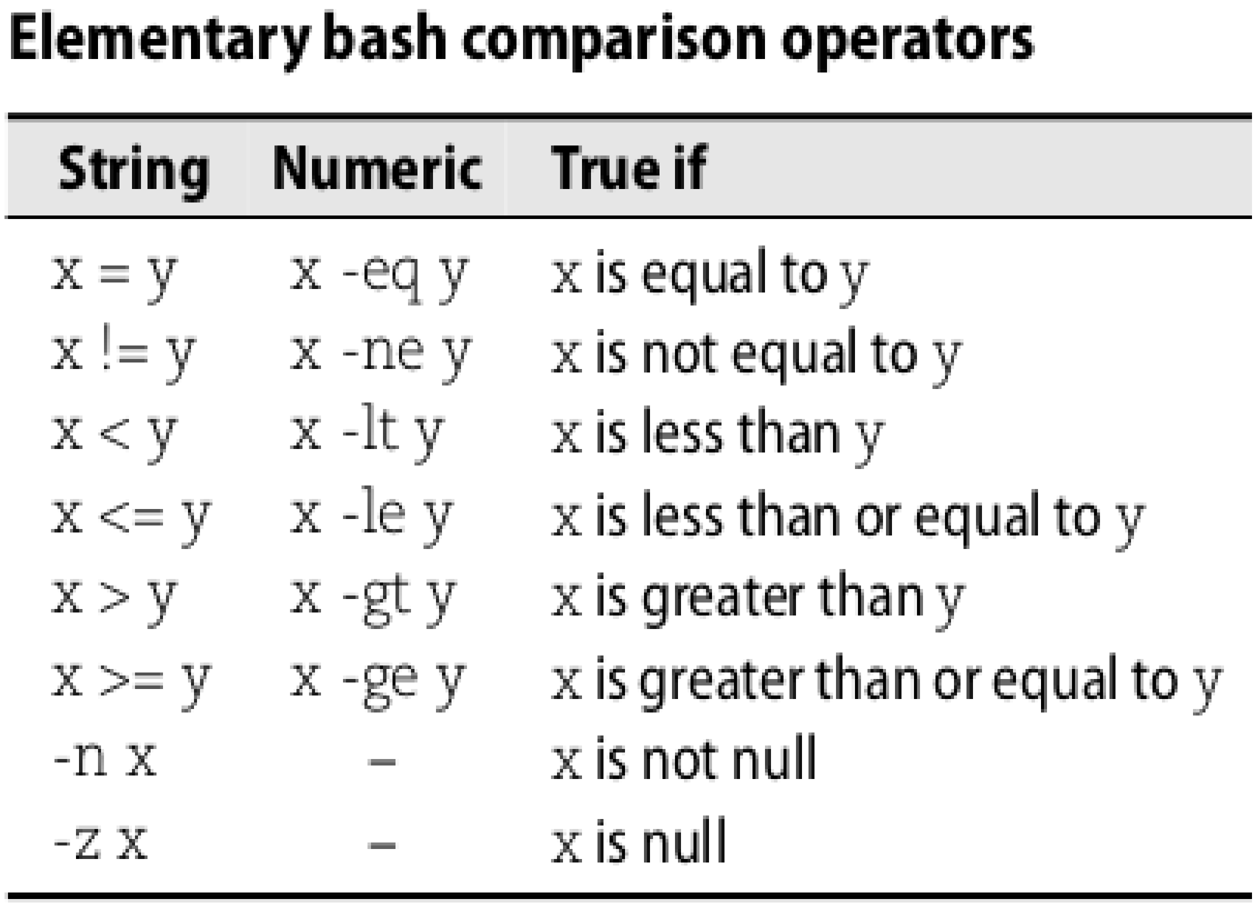
Example:

Following script determine whether given argument number is positive.

```
$ cat > ispostive
#!/bin/sh
# Script to see whether argument is positive
if test $1 -gt 0
then
echo "$1 number is positive"
fi
```

Mathematics,	Meaning	Mathematical Statements	But in Shell	
			For test statement with if command	For [expr] statement with if command
-eq	is equal to	5 == 6	if test 5 -eq 6	if [5 -eq 6]
-ne	is not equal to	5 != 6	if test 5 -ne 6	if [5 -ne 6]
-lt	is less than	5 < 6	if test 5 -lt 6	if [5 -lt 6]
-le	is less than or equal to	5 <= 6	if test 5 -le 6	if [5 -le 6]
-gt	is greater than	5 > 6	if test 5 -gt 6	if [5 -gt 6]
-ge	is greater than or equal to	5 >= 6	if test 5 -ge 6	if [5 -ge 6]

For string Comparisons use Operator	Meaning
string1 = string2	string1 is equal to string2
string1 != string2	string1 is NOT equal to string2
string1	string1 is NOT NULL or is defined
-n string1	True if string is not empty.
-z string1	True if string is empty.



Elementary bash comparison operators

String	Numeric	True if
x = y	x -eq y	x is equal to y
x != y	x -ne y	x is not equal to y
x < y	x -lt y	x is less than y
x <= y	x -le y	x is less than or equal to y
x > y	x -gt y	x is greater than y
x >= y	x -ge y	x is greater than or equal to y
-n x	–	x is not null
-z x	–	x is null

Shell also test for file and directory types Test	Meaning
-s file	Non empty file
-f file	Is File exist or normal file and not a directory
-d dir	Is Directory exist and not a file
-w file	Is writeable file
-r file	Is read-only file
-x file	Is file is executable
file1 -nt file2	file1 is newer than file2
file1 -ot file2	file1 is older than file2

Logical Operators Logical operators are used to combine two or more condition at a time **Operator**	**Meaning**
! expression	Logical NOT
expression1 -a expression2	Logical AND
expression1 -o expression2	Logical OR

if...else...fi

If given condition is true then command1 is executed otherwise command2 is executed.

Syntax:

```
if condition
then
            condition is zero (true - 0)
            execute all commands up to else statement
else
            if condition is not true then
            execute all commands up to fi
fi
```

$ vim isnump_n.sh

```
#!/bin/sh
# Script to see whether argument is positive or negative
if [ $# -eq 0 ]
then
        echo "$0 : You must give/supply one integers"
        exit 1
fi
if test $1 -gt 0
then
        echo "$1 number is positive"
else
        echo "$1 number is negative"
fi
```

```
device0="/dev/sda2"                    # /   (root directory)

if [ -b "$device0" ]
then
  echo "$device0 is a block device."
fi
# /dev/sda2 is a block device.


device1="/dev/ttyS1"                      # PCMCIA modem card.

if [ -c "$device1" ]
then
  echo "$device1 is a character device."
fi

# /dev/ttyS1 is a character device.
```

```
String=' '                                      # Zero-length ("null") string variable.

if [ -z "$String" ]
then
  echo "\$String is null."
else
  echo "\$String is NOT null."
fi                                      # $String is null.
```

```
#!/bin/bash
a=4
b=5

if [ "$a" -ne "$b" ]
then
        echo "$a is not equal to $b"
        echo "(arithmetic comparison)"
fi

if [ "$a" != "$b" ]
then
        echo "$a is not equal to $b."
        echo "(string comparison)"
        #     "4"  != "5"
        # ASCII 52 != ASCII 53
fi

# In this particular instance, both "-ne" and "!=" work.

echo
exit 0
```

Nested if-else-fi

$ vim nestedif.sh

```
#!/bin/bash
osch=0
echo "1. Unix (Sun Os)"
echo "2. Linux (Red Hat)"
echo -n "Select your os choice [1 or 2]? "
read osch
if [ $osch -eq 1 ] ; then
    echo "You Pick up Unix (Sun Os)"
else #### nested if i.e. if within if ######
      if [ $osch -eq 2 ] ; then
            echo "You Pick up Linux (Red Hat)"
      else
            echo "What you don't like Unix/Linux OS."
      fi
fi
```

You can write the entire if-else construct within either the body of the if statement of the body of an else statement. This is called the nesting of ifs.

Multilevel if-then-else

Syntax:

```
if condition
then
            condition is zero (true - 0)
            execute all commands up to elif statement
elif condition1
then
            condition1 is zero (true - 0)
            execute all commands up to elif statement
elif condition2
then
            condition2 is zero (true - 0)
            execute all commands up to elif statement
else
            None of the above condtion,condtion1,condtion2 are
       true(i.e.all of the above nonzero or false)
            execute all commands up to fi
fi
```

$ cat > elf.sh

```
#!/bin/sh
# Script to test if..elif...else
if [ $1 -gt 0 ]; then
  echo "$1 is positive"
elif [ $1 -lt 0 ]
then
  echo "$1 is negative"
elif [ $1 -eq 0 ]
then
  echo "$1 is zero"
else
  echo "Opps! $1 is not number, give number"
fi
```

Loops in Shell Scripts

Loop defined as:

"Computer can repeat particular instruction again and again, until particular condition satisfies. A group of instruction that is executed repeatedly is called a loop."

Bash supports:

- for loop
- while loop

Note that in each and every loop,

(a) First, the variable used in loop condition must be initialized, then execution of the loop begins.

(b) A test (condition) is made at the beginning of each iteration.

(c) The body of loop ends with a statement that modifies the value of the test (condition) variable.

for Loop

Syntax:

```
for { variable name } in { list }
do

   execute one for each item in the list until the
   list is not finished (And repeat all statement between
   do and done)

done
```

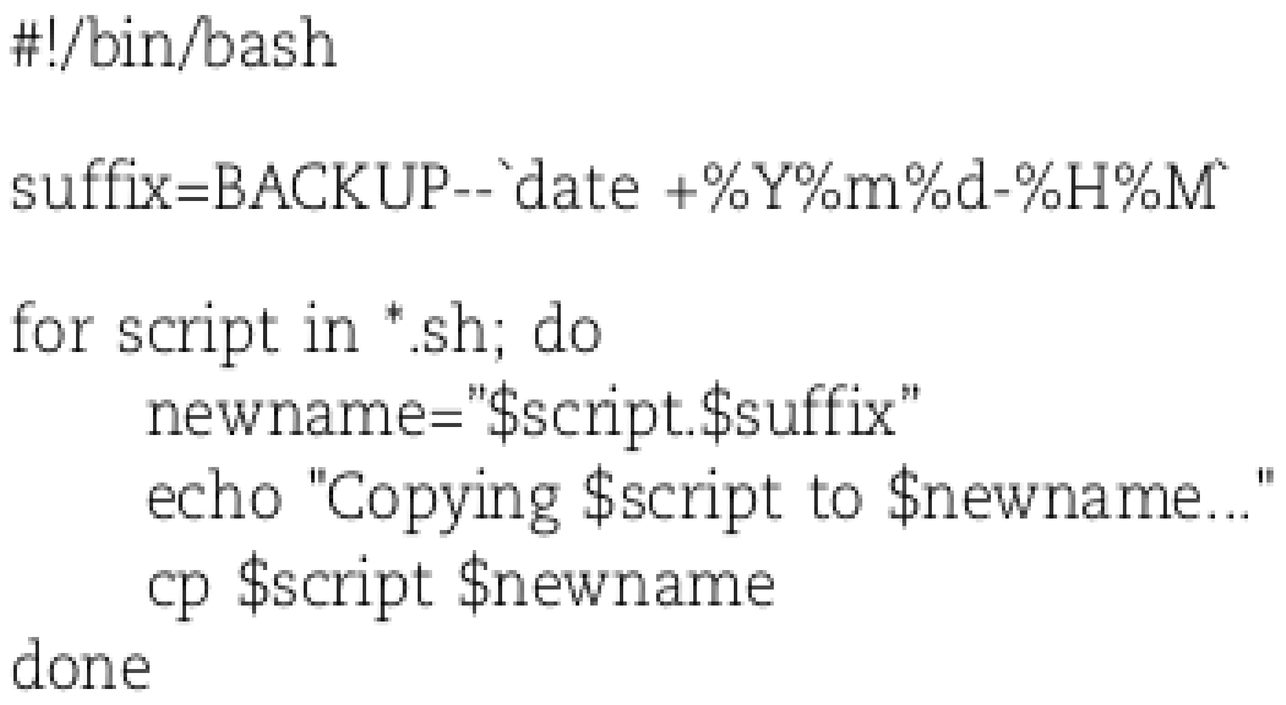
```
#!/bin/bash
#Script to test for loop
if [ $# -eq 0 ]
then
        echo "Error - Number missing form command line argument"
        echo "Syntax : $0 number"
        echo "Use to print multiplication table for given number"
        exit 1
fi
n=$1
for i in 1 2 3 4 5 6 7 8 9 10
do
echo "$n * $i = `expr $i \* $n`"
done
```

```
$ cat > for2.sh
for ((  i = 0 ;  i <= 5;  i++  ))
do
  echo "Welcome $i times"
done
```

E.g 2 nested For loop

$ vi nestedfor.sh

```
for (( i = 1; i <= 5; i++ ))      ### Outer for loop ###
do
    for (( j = 1 ; j <= 5; j++ )) ### Inner for loop ###
    do
          echo -n "$i "
    done
  echo "" #### print the new line ###
done
```



```
#!/bin/bash

suffix=BACKUP--`date +%Y%m%d-%H%M`

for script in *.sh; do
        newname="$script.$suffix"
        echo "Copying $script to $newname..."
        cp $script $newname
done
```

while loop

Syntax:

```
while [ condition ]
do
        command1
        command2
        command3
        ..
        ....
 done
```

```
$cat > nt1.sh
#!/bin/sh              ##Script to test while statement
if [ $# -eq 0 ]
then
   echo "Error - Number missing form command line argument"
   echo "Syntax : $0 number"
   echo " Use to print multiplication table for given number"
exit 1
fi
n=$1
i=1
while [ $i -le 10 ]
do
  echo "$n * $i = `expr $i \* $n`"
  i=`expr $i + 1`
done
```

The case Statement

The case statement is good alternative to Multilevel if-then-else-fi statement.

It enable you to match several values against one variable. Its easier to read and write.

Syntax:

```
case  $variable-name  in
     pattern1)   command
                     ...
                     ..
                     command;;
     pattern2)   command
                     ...
                     ..
                     command;;
     patternN)   command
                     ...
                     ..
                    command;;
     *)              command
                    command;;
esac
```

```
$ cat > car

# if no vehicle name is given

# i.e. -z $1 is defined and it is NULL

# if no command line arg

if [ -z $1 ]

then

        rental="*** Unknown vehicle ***"

elif [ -n $1 ]

then

        # otherwise make first arg as rental

        rental=$1

fi
```

```
case $rental in
   "car") echo "For $rental Rs.20 per k/m";;
   "van") echo "For $rental Rs.10 per k/m";;
   "jeep") echo "For $rental Rs.5 per k/m";;
   "bicycle") echo "For $rental 20 paisa per k/m";;
   *) echo "Sorry, I can not gat a $rental for you";;
esac
```

How to de-bug the shell script?

While programming shell sometimes you need to find the errors (bugs) in shell script and correct the errors (remove errors - debug). For this purpose you can use -v and -x option with sh or bash command to debug the shell script. General syntax is as follows:

Syntax:

bash   option   { shell-script-name }

Option can be

-v   Print shell input lines as they are read.

-x   After expanding each simple-command, bash displays the expanded value of PS4 system variable, followed by the command and its expanded arguments.

```
$ cat > dsh1.sh
#
# Script to show debug of shell
#
tot=`expr $1 + $2`
echo $tot
-------------------------------------------------------------
Press ctrl + d to save, and run it as
$ chmod 755 dsh1.sh
$ ./dsh1.sh 4 5       #Executiong output
9
$ sh -x dsh1.sh 4 5  #debugging
```

Function defined

```
#!/bin/bash

JUST_A_SECOND=1
funky ()
{      # This is about as simple as functions get.
  echo "This is a funky function."
  echo "Now exiting funky function."
}
```

Function defined

Calling functions

```
fun ()
{                                        # A somewhat more complex function.
  i=0
  REPEATS=30
  echo
  echo "And now the fun really begins."
  echo
  sleep $JUST_A_SECOND    # Hey, wait a second!
  while [ $i -lt $REPEATS ]
  do
    echo "----------FUNCTIONS---------->"
    echo "<------------ARE------------"
    echo "<------------FUN------------>"
    echo
    let "i+=1"
  done
}

                 # Now, call the functions.
funky
fun
exit 0
```

Questions

&

Answers